

C L A I M S

1. Method for the catalytic reduction of an amide for the
5 preparation of an amine at a temperature of below 200°C and a
pressure of below 50 bar, the catalyst being chosen from bimetallic
and trimetallic catalysts of the group consisting of ABC, AB, AC and
BC, wherein:
A is a metal, chosen from the group, consisting of Co, Fe, Ir, Pt, Rh
10 and Ru,
B is a metal, chosen from the group, consisting of Cr, Mo, Re and V,
and,
C is a metal, chosen from the group, consisting of Cu, In and Zn.
- 15 2. Method according to claim 1, wherein the catalyst is a
heterogeneous catalyst on a support.
3. Method according to claim 2, wherein the support is chosen from
carbon, silica, titania, silica-alumina or a combination thereof.
- 20 4. Method according to any of the preceding claims, wherein the
pressure is 30 bar or less, preferably 15 bar or less.
5. Method according to claim 4, wherein the pressure is between 1-
25 17 bar, preferably between 5-10 bar, most preferably between 6-10
bar.
6. Method according to any of the preceding claims, wherein the
reduction is performed in continuous flow mode, preferably in a
30 gaseous phase.
7. Method according to any of the preceding claims, wherein the
temperature is 160° or less.
- 35 8. Method according to claim 7, wherein the temperature is 130°C or
less.
9. Method according to claim 8, wherein the temperature is between
70°C-100°C, preferably around 80°C.
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10. Method according to any of the claims 1-5, wherein the reduction is performed in batch mode, preferably in liquid phase.
- 5 11. Method according to claim 10, wherein the amide is dissolved in a Bronsted-acid.
12. Method according to claim 11, wherein the acid is an organic acid.
- 10 13. Method according to claim 12, wherein the organic acid is a carboxylic acid.
14. Method according to claim 13, wherein the carboxylic acid
- 15 comprises acetic acid.
15. Method according to any of the claims 11-14, the acid having a pKa value of 5 or less, preferably between 3 and 5.
- 20 16. Method according to any of the preceding claims, the concentration of the acid being 1.0 M or less, preferably between 0.2 and 0.8 M, more preferably between 0.4 and 0.5 M.
17. Method according to any of the claims 10-16, the liquid phase
- 25 comprising an additive comprising a Lewis acid.
18. Method according to claim 17, wherein the Lewis acid comprises a Boron compound.
- 30 19. Method according to claim 17 or 18, wherein the ratio amide:additive is 4 or less, preferably 2 or less, most preferably between 0.9 and 1.1.
20. Method according to any of the claims claim 10-19, wherein the
- 35 temperature is between 90-140°C, preferably 100-130°C.

21. Method according to any of the preceding claims, wherein the catalyst is chosen from the group, consisting of:

CoCu	IrMoCu
FeIn	IrReCu
FeRe	IrReZn
IrMo	IrVZn
IrRe	PtMoCu
IrV	PtMoIn
MoIn	PtMoZn
PtMo	PtReCu
PtRe	PtReIn
PtV	PtReZn
ReIn	PtVIn
RhCu	PtVZn
RhIn	RhMoCu
RhM	RhMoIn
RhRe	RhMoZn
RhV	RhReCu
RuRe	RhReIn
CoMoZn	RhReZn
CoReCu	RhMoZn
CoReIn	RhVIn
CoVIn	RuReCu
FeCrIn	RuReZn
FeReCu	
FeReIn	
FeReZn	

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22. Method according to claim 21, wherein the catalyst is chosen from the group, consisting of IrMo, IrRe, PtRe, PtV, RhRe, RhV, FeReIn, PtReCu, PtReIn, PtReZn, RhMoCu, RuReZn, PtMo, RhMo, RuRe, IrReZn and PtMoCu.

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23. Method according to claim 22, wherein the catalyst is chosen from the group, consisting of IrReZn, PtReCu, PtReIn, FeReIn, PtMo, PtV, RhMo, PtMoCu, RhMoCu, PtRe, and RuRe.

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24. Method according to claim 23, wherein the catalyst is chosen from the group, consisting of PtReCu, PtRe, PtMo IrReZn, PtMoCu and PtReIn.

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25. Bi- or trimetallic catalysts for the reduction of amides to amines, chosen from the group, consisting of:

CoCu	IrMoCu
FeIn	IrReCu
FeRe	IrReZn
IrMo	IrVZn
IrRe	PtMoCu
IrV	PtMoIn
MoIn	PtMoZn
PtMo	PtReCu
PtRe	PtReIn
PtV	PtReZn
ReIn	PtVIn
RhCu	PtVZn
RhIn	RhMoCu
RhV	RhMoIn
CoMoZn	RhMoZn
CoReCu	RhReCu
CoReIn	RhReIn
CoVIn	RhReZn
FeCrIn	RhMoZn
FeReCu	RhVIn
FeReIn	RuReCu
FeReZn	RuReZn

26. Bi- or trimetallic catalyst according to claim 25, the catalyst
 5 being chosen from the group, consisting of IrMo, IrRe, PtRe, PtV, RhV, FeReIn, PtReCu, PtReIn, PtReZn, RhMoCu, RuReZn, PtMo, IrReZn and PtMoCu.

27. Catalyst according to claim 26, chosen from the group,
 10 consisting of PtReCu, PtRe, PtMo IrReZn, PtMoCu and PtReIn.

28. Method for the selection of at least one bi- or trimetallic catalyst, active in the reduction of amides into amines, from a collection of bi- and/or trimetallic catalysts comprising the steps
 15 of:

- A) preparing the catalysts on separate carriers,
- B) loading the catalysts prepared in step A) in separate reactor vessels, the vessels having a parallel arrangement,
- C) feeding and incubating the reactor vessels with an amide
 20 and hydrogen at identical conditions regarding at least one of the quantities, chosen from reaction time, temperature and pressure,
- D) measuring the conversion of amides into amines in each reactor vessel,
- E) selecting one or more of the catalysts, based on the
 25 measured conversion in step D).

29. Method according to claim 28, wherein in step C) the reaction time, temperature and pressure in the reactor vessel are similar for each reactor vessel.

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30. Method according to any of the claims 28-29, wherein in step A) the catalysts are prepared on separate carriers in parallel.

31. Method according to any of the claims 28-30, wherein in step C)
10 the reaction vessels are fed in parallel.